

Appl. No. 09/706,937
Amdt. dated June 7, 2007
Reply to office action of February 8, 2007

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REMARKS

This is in response to the Office Action mailed on February 8, 2007. The Office Action rejected Claims 1-6 and 8-15 under 35 USC §101. The Office Action rejected Claims 2, 11 and 13-14 as being obvious in view of the combination of U.S. Pat. No. 6,684,219 ("Shaw") and U.S. Pat. No. 6,470,344 ("Kothuri"); Claims 1, 3-6, 8-10 and 15 as obvious in view of the combination of Shaw, Kothuri and U.S. Pat. No. 5,974,419 ("Ashby"); Claim 12 as obvious in view of the combination of Shaw, Kothuri and U.S. Pat. No. 5,930,474 ("Dunworth").

Applicants have amended Claims 1, 2, 3, 14 and 15. Applicants respectfully request reconsideration of the pending claims in view of the following remarks. Applicants submit that all of the pending claims in the present application are allowable, as explained below.

§101 Rejections

Applicants have amended independent Claims 1, 2 and 14 to overcome the rejections. Applicants contend that the independent claims now conform to guidelines set forth in MPEP §2106.01. Accordingly, the Applicants respectfully request that this rejection be withdrawn.

Independent Claim 1

Applicants' independent Claim 1 recites creating a single indexing structure that includes three dimensions. The data indexed by the structure are searchable spatially using the first and second dimensions, and the data are searchable for rank information using the third dimension. Applicants' independent Claim 1 was rejected as being obvious in view of the combination of Shaw, Kothuri and Ashby. Claim 1 is not obvious because the combination does not disclose all of the elements of this claim.

First, as indicated in the Office Action (page 9), Shaw does not disclose the recited single indexing structure that includes three dimensions with the first and second dimensions being spatially searchable using latitude and longitude information and the third dimension being searchable for rank. The Shaw system discloses separate indexing structures: one with spatial indexing scheme of the quad tree and another object-orientated indexing scheme for non-spatial information based on attribute. (*see*: Shaw, column 17, lines 5-21). Accordingly, the Shaw system discloses and suggests using two separate indexing structures rather than the recited single indexing structure. Thus, Shaw fails to disclose or suggest the recited claim elements.

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Ashby¹ was cited by the Office Action as teaching rank. (*see*: Office Action, page 5).

The portion of Ashby cited by the Office Action is similar to the description in the Background of the Invention of the present application. Specifically, each layer with its corresponding rank(s) has a separate index. (*see*: Ashby, column 20, lines 52-53). Accordingly, Ashby does not disclose the recited three dimensional index.

Kothuri was cited by the Office Action as teaching "a single indexing structure (i.e. R-TREE in Fig.4, col. 3, line 50 to col.4, line 18); said first and second dimensions of said indexing structure (i.e. a set of multi-dimensional/multi-attribute data items is indexed by recursively clustering the data items into smaller collections until each cluster can be stored (i.e. indexed) in a single leaf of a hierarchical (e.g., tree-structured) index, col. 3, lines 32-43); using said third dimension of said indexing structure (i.e. a dimension may be selected based upon an expected or specified query pattern, col. 3, lines 44-55)."

Applicants would like to point out that the Kothuri index for multidimensional data is similar to the prior art index for geographic data disclosed in the Background of the present application. The prior art index disclosed in the Background of the present application includes root node and intermediate nodes that include boundary information. The indexed data can be a collection of data items that represent the geographic features encompassed within a bounded area. (*see*: Specification, Figure 1, page 1, lines 15-25). The Applicants respectfully point out that Fig. 4 of Kothuri is very similar to Figure 1 of the Specification.

Additionally, Applicants would like to further point out that Kothuri discloses providing separate indexes for different hierarchy of selectivities or granularities:

Within a particular data dimension or attribute, a hierarchy of selectivities or granularities may be specified. In various embodiments of the invention, one or more indexes may be constructed and stored in a database for a set of data items by choosing different selectivities for one or more dimensions or attributes. For example, a region dimension of sales data may include values for both city and state. A first index may then be constructed on the basis of city-level selectivity in the region dimension and, for example, a year selectivity in a time dimension. Another index may be constructed using state and year selectivities. (*see*: Kothuri, column 6, lines 11-21).

Multiple indexes can be constructed by choosing different selectivity values for a dimension or attribute hierarchy. For example, one index may be constructed to cluster on year and city granularities/selectivities (e.g., for time and region dimensions) as in an earlier example. Another index may be constructed using year and state granularities. The number of possible index structures increases as the hierarchy (e.g., number of tiers) in each dimension or attribute increases. Thus, if a county attribute is added to the region dimension then query patterns could be

¹ The Ashby patent is assigned to the assignee of the present application, NAVTEQ North America, LLC. To the extent permitted by law, any statements in the present Amendment regarding the disclosure of the Ashby patent should not be used to restrict the scope of claims in the Ashby patent.

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designed accordingly, which may affect the number of query retrieval units and the manner in which the dataset is divided. As one skilled in the art will appreciate, multiple indexes are useful in parallel evaluation of expensive OLAP (OnLine Analytical Processing) operations, such as CUBE in warehousing applications. (see: Kothuri, column 14, lines 18-33).

Thus, Kothuri clearly states that separate indexes are generated for different selectivities or granularities, such as one index for a city-year granularity and another separate index for a state-year granularity.

Again the disclosure of Kothuri is similar to the Background of the present invention. Like Kothuri, the Background description of the prior art also discloses providing separate indexes for different hierarchy of selectivities or granularities. As illustrated in the prior art example of Figure 1 of the present application, three separate indexes are used for the three layers that include data that represent geographic features having the three different associated ranks. Each separate layer includes its own separate index. Additionally, because each lower layer includes all the items of data represented in all higher layers, many items of data that represent the same feature are physically stored more than once. For example, Figure 1 shows the items of data in the box labeled with an "x" that appear three times. (see: Specification, Figure 1, page 3, lines 8-17).

The Applicants' invention recited in Claim 1 includes an index structure with a third dimension that includes rank information. Because the rank information is incorporated into the index, there is no need to provide separate indexes for the different hierarchy of selectivities or granularities. Accordingly, a data item which is stored three times in the prior art embodiment of Figure 1 (as shown by the three "x"s) can be stored once in the embodiment recited in Claim 1 as shown in Figure 2 (as shown with the one "x"). (see: Specification, Figures 1 & 2, page 6, lines 1-3). Thus, the Applicants' index, recited in Claim 1, provides significant advantages over the prior art.

Applicants will now address the positions on page 10 of the Office Action. Applicants respectfully point out that the R-TREE in Fig.4 of Kothuri does not disclose the recited single indexing structure with three dimensions. Fig. 4 of Kothuri illustrates a result of indexing the dataset of Fig. 3 (see: Kothuri, column 12, lines 55-56) which is a set of two-dimensional data with the x- and y-axes representing latitude and longitude. (see: Kothuri, column 12, lines 55-56). Accordingly, Fig. 4 of Kothuri merely discloses the R-Tree that comprises latitude and longitude information and does not disclose comprising the recited rank information.

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Additionally, Kothuri's disclosure of selecting a dimension of the index based upon an expected or specified query pattern (*see*: Kothuri, column. 3, lines 44-55), does not provide the disclosure of the third dimension with rank information. For example, Kothuri discloses forming an index by selecting a region dimension and time dimension for sales data. "A first index may then be constructed on the basis of city-level selectivity in the region dimension and, for example, a year selectivity in a time dimension. Another index may be constructed using state and year selectivities." (*see*: Kothuri, column 6, lines 18-21). Accordingly, Kothuri fails to disclose the recited single indexing structure that includes three dimensions, and the data indexed by the structure are searchable spatially using the first and second dimensions and searchable for rank information using the third dimension. In contrast, Kothuri discloses having separate indexes for different ranks.

For at least these reasons, the combination of Shaw, Ashby and Kothuri fails to disclose or suggest every claim element, Applicants' independent Claim 1 is not obvious in view of the combination.

Independent Claim 2

Applicants' independent Claim 2 was rejected as being obvious in view of Shaw and Kothuri. Claim 2 recites a single index structure that includes two spatial dimensions and a non-spatial third dimension. The geographic data indexed by the structure are searchable spatially using said two spatial dimensions and are searchable for a non-spatial property of the indexed geographic data using the third dimension. Claim 2 is not obvious because the combination does not disclose all of the elements of this claim.

First as discussed above, Shaw does not disclose the recited single index structure that includes two spatial dimensions and a non-spatial dimension. In contrast, the Shaw system discloses separate spatial and non-spatial indexing structures. (*see*: Shaw, column 17, lines 5-21). Thus, Shaw fails to disclose or suggest the recited claim elements.

Second as discussed above, Kothuri also fails to disclose the recited single index structure that includes two spatial dimensions and a non-spatial dimension. Kothuri clearly states that separate index structures are generated for different selectivities or granularities, such as one index for a city-year granularity and another separate index for a state-year granularity. (*see*: Kothuri, column 6, lines 11-21; column 14, lines 18-33). Kothuri does not include the non-spatial property of rank, granularity or scale information in the single index structure, rather

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Kothuri teaches separate indexes for different ranks, granularities or scales.

Because Shaw and Kothuri fail to disclose or suggest every claim element, Applicants' independent Claim 2 is not anticipated by this combination.

Independent Claim 14

Applicants' independent Claim 14 was rejected as being obvious in view of the combination of Shaw and Kothuri. Applicants submit that Claim 14 is not obvious in view of this combination for similar reasons as discussed above in conjunction with Claim 1. Because the combination fails to disclose or suggest every claim element, Applicants respectfully request that this rejection be withdrawn.

Dependent Claims 3-6, 8-13 and 15

Applicants' Claims 3-6, 8-13 and 15 are dependent claims that distinguish the cited references at least for the same reasons explained above in connection with their independent base claims. In addition, these claims recite further features and limitations that are neither disclosed nor suggested by these references.

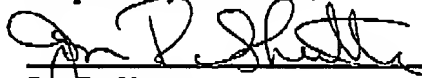
Petition for extension of time

Included with this response is a request for an extension of time to reply to the office action dated February 8, 2007. Included with this response is an authorization for payment of the fee associated with this request.

Conclusion

All the issues in the office action, dated February 8, 2007 have been addressed. Favorable consideration of the present application is requested. If any issues remain, the Examiner is invited to call the undersigned.

Respectfully submitted,



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